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the twisting, rotary, or cyclonic form. One of the tongues was brighter than the solar surface, and seemed to be the most brilliant at from 9.30 to 10.30 A.M., at which time the electric wave disturbed the telegraphs. Whether the solar turbulence causes terrestrial magnetic upheavals is a question that future physicists must decide.

A sun-spot maximum is drawing near, and already there are lively electro-magnetic times.

EDGAR L. LARKIN.

Knox College Observatory, July 19.

#### The Crinoid *Heterocrinus Subcrassus*.

TWO or three years since, I concluded to find out, if I could, the character of the termination of the column of the crinoid *Heterocrinus subcrassus*. Having a lower Silurian slab with about one hundred specimens of the calyx, with a great profusion of the columns diverging in every direction, I selected a column attached to its calyx, and followed it by uncovering, until I was rewarded by discovering the column diverging into well-defined roots; length of column from calyx  $12\frac{1}{2}$  inches, about  $1\frac{1}{4}$  inches under the surface.

At that time I believed that the genus *Glyptocrinus* were floaters, and devoid of bases, or roots.

About eighteen months ago something caused me to doubt that idea, and I commenced the investigation of the terminations of their columns, and now, after a great deal of work, and after many discouragements, I have been able to so far develop roots on the terminations of the columns of *Glyptocrinus neali*, *Glypt. dyeri*, and *Glypt. baeri*, that I have a specimen of each species, showing the calyx, column, and roots intact, on the slab, one slab of *Glypt. baeri* having on its surface several specimens of that character.

One character of the specimens surprised me,—the diversity of the length of the columns between calyx and roots in the specimens just mentioned, the column of *Glypt. neali*, from two to four or five inches; *Glypt. baeri*, from one-half an inch to six or eight; *Glypt. dyeri*, from one to four or five inches between calyx and roots.

I have also found a specimen of *Heterocrinus simplex*, showing calyx, column, and inverted saucer-like base, attached to another column.

DR. D. T. D. DYCHE.

Lebanon, O.

#### Professor Parker's Further Studies on the Apteryx

IN No. 435 of *Science* the writer invited attention to the very valuable contributions to our knowledge of the morphology of Apteryx that had been made by Professor T. J. Parker, F.R.S., of the Otago Museum (New Zealand). Those investigations have been continued on more extensive material, and the London Royal Society have just published in their Transactions (1892) the results, in a paper entitled "Additional Observation on the Development of Apteryx" (11 pages; two col. lith. plates, of 19 figs.). Professor Parker has kindly sent me a copy of this work, and I desire to say, in the present connection, in continuation of what already has been noted by me in my former review, that more advanced embryos of the bird under investigation (stage F<sup>1</sup>) show "the pollex is unusually large, and the fore-limb has the characters of the wing of a typical bird." Better figures are given than in the first paper, showing structures of the brain and skull, and also that one "specimen exhibits an unusual mode of termination of the notochord." In other figures (stage G') the final form of the chondrocranium, before the appearance of cartilage bones, is shown, and, what is a very interesting fact, "that in *A. oweni* there is always a solid coracoid region to the shoulder-girdle, while in *A. australis*, as far back as stage F', there is a coracoid fenestra and a ligamentous procoracoid." Finally, it is worthy of note that "in addition to the elements described in the corpus an intermedium may be present." As I have already said, the working out of these anatomical characters, in such an important form as Apteryx, will most certainly prove to be of the highest importance and use to the general comparative anatomist the world over. There could be no safer hand to accomplish it for us than that of the distinguished biologist of the Otago Museum.

R. W. SHUFELDT.

Takoma, D.C., July 24.

#### A Satellite of the Moon

I HAVE seen accounts of an attempt to discover whether the moon has a satellite, and the accounts that have reached me seem to show one serious fault in the procedure. While I am not thoroughly conversant with all the points involved, it does seem to me, that, in taking a photograph of the region in which such a satellite would be found if it exists, the apparatus should be arranged with reference to stellar motion, and leave the moon out of question. Of course, the moon would be blurred, but we are not concerned about that. The fixed stars would appear plainly on the plate, while any one that had a motion different from theirs, especially a rapid motion such as a satellite of the moon must have, would appear blurred on the plate; in which case only the blurred stars, if such occurred, need be examined with any hope of finding a satellite of the moon.

C. P. MAXWELL.

Dublin, Tex., July 20.

#### Auroral Display.

ON Saturday night, July 16, 1892, I was returning to my home in Rockville, Indiana, from Clinton, Indiana, sixteen miles southwest. Mr. Harry McIntosh, a young man of this place who had been helping me make a survey near Clinton, was riding with me in my buggy. We amused ourselves looking at a most beautiful sunset as we rode over the Lafayette and Terre Haute road, along the foot of the high hills east of the Wabash River.

When we turned eastward, over the hills toward Rockville, it began to grow dark, and most of the clouds that showed up so beautiful at sunset began to vanish, till only a few streaks of stratus clouds remained. As we were descending the west hill at Iron Creek, five miles south-west of Rockville, we saw in front of us what we supposed was the new electric light at Rockville, thrown upward and reflected from a cloud or mist. As we were ascending the hill on the east side of the creek and near its summit, we saw in our front the reflection of a great light from behind us. It was so noticeable as to cause us both to turn about on our buggy seat and look backward. There, at a bearing S. 60° W. (that is the bearing of the road, with which the light was in alinement), we saw a great white light radiating from a point at the horizon where it was brightest, right, left, and upward to a height of 10° to 15°, weakening in brilliancy as it radiated and terminated in a dark band or segment of rainbow shape, some 10° wide. The light seemed to radiate from a point a half-radius above the centre of the circle which the black segment would indicate. Above the dark segment another segment or band of light, not so bright as the one at the horizon, formed a rainbow, or arch, some 10° to 15° wide. Above that second band of light was a light haze, or mist, through which the stars could be easily distinguished. Some 10° up in that mist, and directly over the centre of the light at the horizon, was a light about as large as a man would appear to be if suspended from a balloon a thousand feet distant. It was about four times as long vertically as wide horizontally. Young McIntosh saw it first and called my attention to it, as I was watching the bright light at the horizon. When I first caught sight of it, it had the appearance of the head of a comet, only it was long vertically. When young McIntosh first saw it, it seemed to be a blaze such as a large meteor appears to carry at its front. We halted and watched it about ten minutes, during which time it (the small light) slowly faded till only its locality could barely be noticed, then suddenly loomed bright almost to a white blaze, then slowly faded as before. It would loom up in five seconds, and consume five minutes in fading away. It kept the same position all the time, for we watched its position with relation to the stars to see if it moved. At this second appearance I decided to commit the general appearance to memory so I could sketch it afterward. This little light loomed up and faded four times when the big light under it faded also and made it dark there.

I am not sure we saw this light the first time it appeared, but think we did. The small light above looked as the moon does when shining through a thin cloud, except as to the oblong shape vertically.

When the first or south-western light faded nearly out, a light